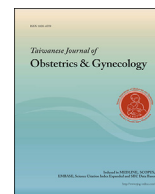




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## Review Article

## Review of care and management of pregnant women during COVID-19 pandemic

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## ABSTRACT

Coronavirus disease-19 (COVID-19) is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Covid-19 pandemic began in the end of 2019 and spread all over the world in a short duration of time. Measures have been taken such as social distancing, compulsory lockdown and restriction of activities so as to prevent spread of virus. It has posed problem to both the antenatal women and maternity care workers. The care and management of pregnant women is an essential service to identify high-risk mothers and also to have good pregnancy outcome for both mother and baby. Any delay in this may lead to catastrophe, hence this issue needs to be addressed properly. This review briefs about the literature available on antenatal care during covid-19 pandemic. Pregnancy is not very adversely affected by the virus itself but extra caution should be taken to prevent and complications should they arise. The norms of social distancing by patients and wearing personal protective equipment by hospital staff, testing of pregnant women should be followed as per regional and national guidelines. This will help ensure safety of all people along with care to the expecting mother. The presence of covid-19 infection should not deter women from receiving antenatal care nor should the obstetric treatment be delayed during labor. Decision for timing and mode of delivery should be individualised based on obstetric indications and maternal–fetal status.

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## Introduction

Novel Coronavirus-19 causes a very infectious disease resulting into pneumonia and severe respiratory illness. It has emerged as an outbreak towards the end of the year 2019 and has been declared as global pandemic by WHO (World Health Organisation) [1]. Covid-19 disease was first reported in Wuhan, Hubei Province, China in December 2019 and is associated with high morbidity and mortality across the world. The disease mainly affects adults with higher mortality rate in elderly and compromised people [2]. A little is known about the effect of covid-19 disease on health of pregnant women. There are case reports and case series on coronavirus disease in pregnancy but a large proportion of data is still unpublished and hence, unknown. The questions which need to be answered are whether pregnant women are at higher risk of contracting the disease, or are they more prone to develop serious complications of the disease, is there any increased risk of abortion or preterm delivery in these women, or whether there is any risk of vertical or perinatal transmission to the fetus [3,4]. Based on the

available literature, we are providing a narrative review on the care of antenatal women during this pandemic.

*Causative agent*

Coronavirus disease-19 (COVID-19) is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Coronaviruses belong to the family Coronaviridae, order Nidovirales [5]. These are non-segmented, enveloped RNA viruses which include severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) [5]. These two viruses have caused epidemics in past two decades with mortality rate of 10% for SARS-CoV and 37% for MERS-CoV [6]. WHO has estimated global mortality of COVID-19 to be 3.4% but recent reports have suggested mortality of 1.4% after adjustment for case ascertainment rate and time lag between symptoms and deaths [7,8].

*How the antenatal care is affected*

COVID-19 pandemic has led to compulsory lockdown, curfews and containment of activity of all people across the globe. This was

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done to promote physical distancing thereby preventing community spread of the virus and for preparedness of the healthcare facilities to deal with the pandemic. This resulted in limitation of utilisation of the healthcare facilities by one and all including pregnant women. Many private hospitals and health centres are only providing emergency services and not entertaining routine patients. Tele-consultation facility has also started amidst this hassle. In the current scenario, Some of the expecting mothers have not registered their pregnancies and are unable to visit the clinician or health centre. This problem is more in developing countries. This might lead to missing out high risk factors in due course of pregnancy. As a result, these high risk women lend up in complications. There is a need to streamline the health services in providing appropriate and timely care to expecting mothers.

### Transmission

Most cases have human to human transmission but there is evidence that virus spreads through respiratory, fomites and faecal methods. The vertical transmission of virus from mother to fetus (antenatally or intrapartum) is not proven yet. Studies have been done where sampling of amniotic fluid, placental membranes, umbilical cord swabs, cord blood and breast-milk samples has been tested negative in most of the cases. The neonatal infection appears to be during bonding and breastfeeding and not transplacental transmission. It is acquired due to droplet or close contact transmission [3,9]. However, a few studies have shown vertical transmission of the virus from mother to fetus [10–12]. This route of transmission is yet to be proved by larger studies. Even some studies have suggested testing of amniotic fluid during labor or caesarean section to establish vertical route of transmission for covid-19 [12,13]. There was a Chinese study done in nine pregnant women in third trimester of pregnancy where amniotic fluid was tested during labor and all the samples were negative; it failed to show any adverse fetal or neonatal outcome [3]. Until now, no case has been reported which document prenatal invasive testing like amniocentesis or chorion villus sampling for covid-19. However, genetic counselling should be done for any fetal and neonatal problems if the infection is acquired in early trimester.

### Effect of covid-19 on mother

Although it was presumed that covid-19 would severely affect pregnancy and symptoms will be worse. But majority of the studies indicate that most women have mild or moderate flu like symptoms [3,10,12,13]. The most common symptom is fever (50.9%), followed by cough (28.4%), fatigue (12.9%), shortness of breath (7.8%) and sore throat in (8%); about one-fourth cases might be asymptomatic and almost 5–7% women require ICU admission for severe symptoms [3,13]. Pregnant women do not seem to be at higher risk of developing severe COVID-19 infection. If woman is already immune-compromised due to other co-morbidities like diabetes, cardio-pulmonary compromise, renal disease then the disease may have increased morbidity [13,14]. A Study from UK has shown that proportion of pregnant women hospitalised (6%) was similar to that of general population, and pregnancy was not associated with increased mortality [15].

The largest study is reported from UKOSS which shows that women may require hospital admission because of severe symptoms of covid-19 or due to other reasons (labour or delivery) but having less covid-19 symptoms. This study showed a case fatality rate for UK pregnant women hospitalised with COVID-19 of 1.2% (95% CI 0.4–2.7%) and a SARS-CoV-2-associated maternal mortality rate of 5.6 (95% CI 1.8–13.1) per 100,000 maternities [16].

Pregnancy itself is a hypercoagulable state and isolation will increase the risk due to reduced physical activity. Hospitalised individuals with Covid-19 infection shows hypercoagulable state so Covid-19 infection is likely to be associated with increased risk of venous thrombo-embolism during pregnancy. RCOG guideline (May 2020) suggests thromboprophylaxis can be considered and prescribed on a case-to-case basis in the form of low molecular weight heparin (LMWH) [17,18]. These are women who have one or more risk factors for venous thromboembolism (VTE) like anti-phospholipid antibody syndrome (APLAS), previous history of VTE, prolonged immobilisation and ICU admission. They should receive enoxaparin 1 mg/kg subcutaneous injection once daily for period of hospitalisation or 10 days (whichever is longer). Patient need not be monitored while receiving prophylactic anticoagulation [17,18]. Pregnancy and delivery during this pandemic will affect the psychosocial wellbeing of women and their family [17].

### Effect on fetus

Till date, there is no data suggesting the effect of covid-19 on rate of miscarriage, second trimester losses, preterm labour or still birth. There is no congenital effect of virus on fetal development either as there is no documented intrauterine fetal infection [3,10–12].

### Timing of antenatal visits

Various guidelines recommend to continue providing basic and emergency obstetric care. There are minimum four antenatal visits required for expecting mother at 12 weeks, 20 weeks, 28 weeks and then 36 weeks. Apart from these scheduled visits, women can visit her physician as and when the need arises. At these visits, women should be asked history and detailed physical examination is done to assess the progress of normal pregnancy and to identify high risk factor, if any. She should undergo routine antenatal tests, complete blood count, blood pressure and blood sugar testing, combined screening, anomaly scan, USG for growth scan if required (between 28 and 32 weeks).

### Precautions during antenatal visit

Pregnant women should continue visiting their consulting physician or maternity centre if they are not in any containment zone. Most women attending maternity services are healthy and are advised to maintain stringent social distancing [19,20]. They should wear mask while attending the clinic and should keep physical contact with the objects and persons to a minimum. Any women coming for antenatal check-up or otherwise having suspicion or confirmation of COVID-19 should be examined by healthcare worker after wearing full personal protective equipment (PPE) which includes full body gown, N95/triple layer surgical face mask, face shield or eye cover/goggles and sterile gloves. Minimum person should examine the patient in isolation facility. Staff should adhere to PPE guidelines and make every effort to observe social distancing measures at work, even when not patient facing. This includes handwashing, eating in designated areas and maintaining a distance of 2 m between colleagues, where practical. Obstetric care should not be delayed in order to test for covid-19. Women who are self-isolating because someone in their household had possible symptoms of COVID-19 should defer their routine antenatal visit for 14 days, provided there is no emergency. If urgent care is required, she should visit the hospital and obstetric treatment should not be delayed by the healthcare provider [17,19,20].

Pregnant women having suspicion of covid-19 due to symptoms or travel to a high risk area or international travel and contact with

positive person, then she should report to her clinician or hospital telephonically. She should travel by private transport to the hospital only for urgent consultation, otherwise she should self-isolate herself from others for 14 days. Self-isolation means she should stay at home, not mix her utensils, dishes with others, ventilate her accommodation properly, not to go out for work, school or anywhere else for 14 days. Upon arrival in the hospital premises, suspect or covid-19 positive woman should be examined and cared in the isolation room [17,20].

### Whom to test

The testing recommendations are standard and in accordance with national or regional guidelines [21].

Indian council of Medical Research (ICMR) has issued an advisory for COVID-19 testing of pregnant women who show symptoms, have travel history in last 14 days, close contact with positive person, has severe acute respiratory illness.

Women should be offered a test for COVID-19 who are being/are admitted to hospital with one of the following:

- Clinical/radiological evidence of pneumonia,
- Acute Respiratory Distress Syndrome (ARDS),
- Fever  $\geq 37.8$  AND at least one of acute persistent cough, hoarseness, nasal discharge/congestion, shortness of breath, sore throat, wheezing or sneezing.

Furthermore, it is recommended that women with an isolated fever should be investigated and treated according to the unit protocol. This will include sending a full blood count. If lymphopenia is identified on the full blood count, testing for COVID-19 should also be offered.

### Management

A woman with moderate or severe COVID-19 symptoms who happens to be pregnant but with no immediate pregnancy issue should be cared for by the same multidisciplinary team as a non-pregnant woman with additional input from the maternity team. These should not be admitted in labour room/suite [17,18].

ICMR has laid certain criteria for management of women with SARS-CoV 2. They should be managed with multidisciplinary team approach including medicine, obstetrician, anaesthetist, intensivist, and neonatologist. These are as follows:

Criteria for admission to ICU using Quick SOFA (Sequential Organ Failure Assessment) Score; this includes more than one following criteria:

- a. Systolic blood pressure  $< 100$  mmHg
- b. Respiratory rate  $> 22$ /min
- c. Glasgow conscious score  $< 15$

Severe failure criteria in pregnant women: Septic shock, Acute organ failure, fetal distress.

These women who are SARS-CoV 2 positive and hospitalized in tertiary centre should be given following care: maternal surveillance includes 3–4 hourly charting of temperature, heart rate, Blood pressure, respiratory rate, oxygen saturation hourly; and chest imaging (CX ray or CT scan) [17,19,22].

Fetal heart rate should be checked once a day and antenatal corticosteroids to be administered for gestation between 24 and 34 weeks if termination of pregnancy is required. If women is in labor, then electronic fetal heart rate monitoring should be done.

Apart from vital monitoring, treatment of covid-19 positive pregnant women includes [17,19]:

- a) Conservative Intravenous fluid strategies at rate of 75–100 ml/h.
- b) Empirical antibiotic for possible bacterial pneumonia
- c) Oxygenation with mask – maintain saturation  $> 94\%$
- d) Intubation or ventilator as required depending upon the oxygen saturation
- e) Antiviral therapy and plasma therapy for intubated patients
- f) Inotropes/vasopressors in critically ill patients

### Diagnosis of COVID-19

Testing should be done as per regional guidelines [22]. qRT-PCR (quantitative reverse transcriptase polymerase chain reaction) and IgM antibody testing are done for diagnosis of COVID-19 infection. Throat swabs and nasopharyngeal swabs are taken from the patient and are tested for RT-PCR, blood samples are also tested for antibodies [23,24]. Maternal throat swab samples are collected and tested for SARS-CoV-2 with the Chinese Center for Disease Control and Prevention (CDC) recommended Kit (BioGerm, Shanghai, China), following WHO guidelines for qRT-PCR [22,23].

Chest X-ray and CT scan should not be withheld in pregnant women if indicated clinically for management. It can be done with abdominal shielding. These tests are done to detect the extent of covid-19 pneumonia and follow-up. It is definitely indicated in women with severe respiratory illness, X-ray chest showing opacities, or ARDS, pleural effusion, or if there is risk of pulmonary thrombo-embolism. It is mainly required in women who require ICU care or ventilator support for acute severe respiratory illness [19,22].

### Care during labour

The onset of labor should be confirmed properly as per standard of care in all women attending the delivery suite. Women who are suspect or confirmed cases of covid-19 should be monitored in isolation room carefully for observations including temperature, respiratory rate and oxygen saturation, uterine contractions and progress of labor. The fetal monitoring should be done by electronic cardiotocograph (CTG) [19]. Efforts should be made to minimise the number of staff members entering the room and units should develop a local policy specifying essential personnel for emergency scenarios. Asymptomatic birth partners should be asked to wash their hands frequently. If symptomatic, birth partners should remain in self-isolation at home and not attend the unit. The neonatal team should be given sufficient notice at the time of birth, to allow them to attend and wear (donning) PPE before entering the room/theatre. Delayed cord clamping is still recommended following birth, provided there are no other contraindications. The baby can be cleaned and dried as normal, while the cord is still intact [14,15].

### Mode of delivery

There is currently no evidence to favour vaginal or caesarean delivery and therefore it should be discussed with the woman, taking into consideration her preferences and any obstetric indications for intervention. Mode of delivery should not be influenced by the presence of COVID-19, unless the woman's respiratory condition demands urgent intervention for birth. Therefore, mode and timing of delivery should be individualized based on obstetric indications and maternal–fetal status. Delivery should be conducted with PPE and all precautions. All women with suspected or confirmed COVID-19 should be discharged with 10 days of prophylactic LMWH after delivery, provided there is no postpartum haemorrhage or regional anaesthesia (low molecular weight heparin i.e. enoxaparin given as 1 mg/kg subcutaneously once daily;

with first dose given as soon as possible after birth) [17,18]. Elective/planned obstetric procedures (e.g. cervical cerclage or caesarean) should be scheduled at the end of the operating list.

### Breastfeeding

WHO and other bodies recommend continuing breastfeeding to the infant for all postpartum women irrespective of the covid status as the benefits of breastmilk outweighs the risk of contraction of covid-19 by the neonate. Breastmilk provides innate immunity and transfers essential nutrients and IgA antibodies from mother to fetus. And most of the studies have not reported SARS-CoV2 in breastmilk samples [3,19]. Hence, breastfeeding should be allowed even in covid-19 positive mothers but these women should follow proper hand and breast hygiene. Women should wear facial mask while breastfeeding and avoid any droplet spread of the infection. Before each feed, she should wash her hands with alcohol based sanitiser for 20 s and also clean her breast and secretions after any coughing or sneezing episode [17,19]. Expressed breastmilk should be provided to infant in case of severe maternal illness.

### Conclusion

Covid-19 pandemic has posed a great challenge for maternity and other healthcare workers as well as for pregnant women. Although the due course of pregnancy is not much affected by the disease itself but complications may arise in absence of timely care and caution. Both the expecting mother and care-provider should be vigilant and the routine obstetric management should not be delayed due to testing or reports of covid-19 infection.

### Declaration of competing interest

The authors declare no conflict of interest.

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